

ISIS Analysis of IAEA Iran Safeguards Report

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On August 27, 2015 the International Atomic Energy Agency (IAEA) released its [latest report](#) on the implementation of the NPT safeguards agreement in Iran and the status of Iran's compliance with United Nation Security Council resolutions.

Key Findings:

- 1) With regard to the possible military dimensions (PMD) of the Parchin military site, the IAEA reports that it has continued to observe "through satellite imagery, the presence of vehicles, equipment and probable construction materials" at a particular location at the Parchin military complex. The IAEA also observed that "a small extension to an existing building appears to have been constructed." This finding supports ISIS's [August 5, 2015](#) analysis that Iran had renewed activities at Parchin soon after the July 14 signing of the Joint Comprehensive Plan of Action (JCPOA).
- 2) The average monthly production of low enriched uranium (LEU) increased as did the average centrifuge performance of the IR-1 centrifuges in the Natanz Fuel Enrichment Plant.
- 3) Based on the IAEA data in the safeguards report, Iran has a total inventory of 7,845.4 kilograms (kg) of 3.5 percent LEU hexafluoride and the equivalent of another 4,304 kg of 3.5 percent LEU hexafluoride in various chemical forms at the Enriched UO₂ Powder Plant (EUPP). In total, Iran thus has the equivalent of 12,149 kg of 3.5 percent LEU hexafluoride. Under the JCPOA, Iran has agreed to remove or blend down all but 300 kg of this 3.5 percent LEU hexafluoride equivalent.
- 4) As of August 2015, Iran had an estimated 41 kg of near 20 percent LEU in uranium oxide powder, 48.7 kg of near 20 percent LEU in Tehran Research Reactor (TRR) fuel assemblies, and 137.9 kg near 20 percent LEU in scrap, waste, and in-process (all uranium mass). Most of the near 20 percent LEU fed into the line to make TRR fuel has continued to end up as scrap or is in-process rather than in fuel assemblies. Iran has agreed under the JCPOA to remove or blend down all of the near 20 percent LEU except that in TRR fuel assemblies. The amount that will be removed or blended down corresponds to as much as about 80 percent of Iran's stock of near 20 percent LEU.

- 5) Overall, Iran has fed a total of 4,304 kg of UF₆ enriched up to 5% U-235 into the EUPP. However, the plant has worked poorly. By August 17, 2015, the plant had produced only 465.8 kg of uranium in the form of UO₂ enriched up to 5 percent uranium 235.
- 6) Iran does not appear to be making drastic changes to its advanced centrifuge R&D efforts, either in numbers installed or in feed rate, ahead of the implementation of the JCPOA and the changes it will need to make to come into compliance with the JCPOA's advanced centrifuge R&D requirements.
- 7) This safeguards report provides no details about the controversial arrangement between the IAEA and Iran whereby Iran will take environmental samples at the Parchin site under IAEA direction, albeit without IAEA inspectors being physically present during the sampling.

Introduction: New Developments

This report covers the IAEA's new safeguards report on Iran and activities since the last Iran safeguards report dated May 29, 2015. It also discusses recent activities under the interim Joint Plan of Action.

Since the last safeguards report, there have been two key developments. On July 14, 2015, Iran and the E3+3 signed in Vienna the Joint Comprehensive Plan of Action (JCPOA). The JCPOA specifies that in return for sanctions relief, Iran will implement a series of limitations and transparency measures regarding its nuclear program. The IAEA will play a key role in providing verification of Iran's compliance with its commitments and has signed a separate arrangement, called a Roadmap, which will aim to resolve past and present outstanding issues with regard to Iran's nuclear program, known as the possible military dimensions (PMD). The IAEA Director General will issue a final assessment to the IAEA Board of Governors by December 15, 2015 regarding this investigation. Director General Amano stated at the August 25 Board of Governors meeting that the arrangements with Iran under the JCPOA are a "special arrangement and do not set a precedent."

A new United Nations Security Council resolution (passed on July 20), UNSCR 2231, will replace and terminate the six previous resolutions regarding Iran's nuclear program upon Implementation Day of the JCPOA. Implementation Day should occur sometime early next year (some say not before March 2016), after Iran and the E3+3 have finished carrying out their respective commitments. Iran and the E3+3 will begin carrying out their commitments at Adoption Day of the agreement, to occur on or about October 17, 2015, or 90 days after the UN resolution was passed.

ISIS has issued a [series of analyses](#) on the provisions of the JCPOA. It will continue to make available technical analysis of the IAEA's or other national or UN body reporting on Iran and will monitor and assess new developments including Iran's compliance with the JCPOA throughout its implementation.

LEU Production and Centrifuge Levels at the Natanz Fuel Enrichment Plant (FEP)

Iran's total 3.5 percent low enriched uranium (LEU) production at the FEP through August 7, 2015 is reported to be 15,056 kilograms (kg). The FEP is Iran's primary enrichment facility, where the majority of its IR-1 centrifuges are installed. Activity at the Pilot Fuel Enrichment Plant (PFEP), where Iran has enriched uranium up to the 20 percent level until January 20, 2014, is discussed below. The Fordow enrichment plant also produces 3.5 percent LEU, and these stocks are considered below.

The average monthly production of 3.5 percent LEU at the FEP increased over the past reporting period from approximately 217 kg per month to approximately 227 kg per month of LEU hexafluoride. Between October 2014 and February 2015, Iran had achieved the lowest monthly production rate since May 2013. Since February, it has managed to increase the monthly production rate, although it continues to be slightly lower than the average production rate achieved in 2013 and the first half of 2014.

Since November 10, 2013, Iran has had 90 IR-1 centrifuge cascades fully installed for a total of 15,420 IR-1 centrifuges, the same as the previous reporting periods. The number of cascades enriching, namely 54 cascades, remains constant since the previous reporting period; these cascades fed with uranium hexafluoride contain 9,156 centrifuges.¹ Iran fed 7,537 kg of natural uranium hexafluoride into the cascades at the FEP, which corresponds to a daily feed rate of about 87 kg. This rate is slightly higher compared to previous daily feed rates.

Figures 1-5 describe IR-1 centrifuge trends with time, historical average monthly uranium feed and 3.5 percent LEU production rates, and cumulative LEU production at the Natanz FEP.

Iran's centrifuge performance at the FEP can also be evaluated in terms of separative work units (swu). ISIS derives this value from information about LEU production. In the most recent reporting period, the LEU is taken as on average as being 3.5 percent enriched², with an assumed average feed assay of 0.711 percent and tails assay of 0.4 percent.³ The IAEA did not provide updated concentrations in this report, but these older numbers are used, based on a variety of interviews with knowledgeable senior officials close to the IAEA. Using standard idealized enrichment calculations, 645 kg of LEU translates to roughly 1,585 swu, or an average of 18 swu/day. On an annualized basis, this is about 6,650 swu per year (see Figure 6).

¹ It is possible that not all centrifuges within the cascades fed with uranium hexafluoride were operational during the reporting period.

² The IAEA safeguards report mentions an enrichment level of "up to 5 percent," which is a source of some uncertainty. But Iran has had difficulty achieving five percent enriched uranium, and its average value was 3.5 percent for many years. The ideal cascade model utilized by ISIS uses an enrichment level of 3.5 percent for the product. Although this is not a precise figure, it provides an estimate which is reasonable considering Iran's past performance in this area.

³ The calculations are performed using an idealized cascade model, which does not account for a variety of issues in the actual performance of the cascade, including – but not limited to – centrifuges breaking down or performing below their nominal capacity. While an ideal cascade is not achievable in practice, this estimate provides a method to compare swu calculations.

Between October 2014 and February 2015, the average swu/centrifuge-year was 0.66 swu/centrifuge-year, significantly lower than the performance at the FEP in 2013 and 2014.⁴ For most of 2010, this value was about 0.9 kg U swu per year per centrifuge (see Table 1, which lists these values on a quarterly basis since the FEP started operation, and Figure 6, which displays this data graphically). Between February and May 2015, Iran achieved an average swu/centrifuge-year of 0.71 and in the latest reporting period Iran achieved an average swu/centrifuge-year of 0.73. This is still lower than the 2010 average, but closer to the average swu/centrifuge-year since 2011.

Installation of Advanced Centrifuges at Natanz Fuel Enrichment Plant

In a letter dated January 23, 2013, Iran informed the IAEA that its advanced, carbon fiber-based centrifuge, designated the IR-2m, “will be used” in one of the modules of Production Hall A. This statement is widely interpreted as Iran announcing that it had intended to install about 3,000 IR-2m centrifuges, which is the normal deployment in a module.

Under the Joint Plan of Action, Iran agreed to halt installation of any additional centrifuges and to not begin enriching in any new IR-2m machines. In the unit containing IR-2m centrifuges, as of May 17, 2015, the situation remained unchanged from the IAEA’s previous report: six cascades had been fully installed with IR-2m centrifuges; none of these cascades had been fed with natural uranium hexafluoride; and preparatory installation work had been completed for the other 12 IR-2m cascades in the unit.

Iran had not begun enriching in any of these cascades. Figure 7 tracks the IR-2m installation at the FEP.

Centrifuge Research and Development (R&D) at the Natanz Pilot Fuel Enrichment Plant

Iran is not precluded from continuing its centrifuge R&D activities under the extended interim Joint Plan of Action (JPA). It will face additional restrictions under the JCPOA. Under the JPA, Iran agreed that it cannot feed uranium hexafluoride into any centrifuges that had not been fed with UF₆ as of November 2013. Moreover, in the advanced centrifuges, after enrichment and the measurement of the enrichment level of the product, the product is remixed with the tails or waste, producing natural uranium.

Four out of six cascades at the pilot plant have been dedicated to this on-going centrifuge research and development. They are cascades 2, 3, 4 and 5. As of August 23, 2015, there were:

- In Cascade 2: 8 IR-6 centrifuges (down from 12 IR-6 in the previous report, 13 IR-6 in February, and nine in November); 11 IR-4 centrifuges (same as previous report, down from 12 IR-4 in February, and 13 IR-4 in November); 2 IR-1 centrifuges (same as previous

⁴ The value from the previous two reporting periods was 0.75 swu/centrifuge-year.

two reports, and down from 14 in November); and one unconnected IR-5 centrifuge and one unconnected prototype IR-8 centrifuge installed;

- In Cascade 3: 8 IR-1 centrifuges (same as previous report, down from 15 in February, and 14 in four previous reports); 10 IR-2m centrifuges (down from 26 IR-2m in previous report, and up from two in February and November); 10 IR-4 centrifuges (up from two in previous report and down from 23 in February); and 7 IR-6 installed (up from zero in previous reports);
- In Cascade 4: 164 IR-4 centrifuges (same as in the past year plus); and
- In Cascade 5: 162 IR-2m centrifuges (same as in the past year plus).

Natural UF₆ Feed Rate Roughly Same into PFEP Advanced Centrifuges

As in previous reports, Iran has intermittently fed natural uranium hexafluoride into IR-6s centrifuges as single machines and into IR-1, IR-2m, IR-4, and IR-6 centrifuges, sometimes into single machines and sometimes into cascades of various sizes.

In February 2015, the average rate of feeding of natural UF₆ was significantly greater than the feed rate in three prior reporting periods (October 2013 to October 2014) and more than double the rate of the previous reporting period's feed rate (August 2014 to October 2014).

The May 2015 report then indicated that Iran had cut its rate of feed by roughly 40 percent since the marked increase.

The August 2015 report indicates that Iran's rate of feed remains roughly the same as in the May 2015 report.

- According to the IAEA's February 2015 report, between October 11, 2014 and February 1, 2015, 790.9 kg of natural UF₆ was fed into centrifuges in the R&D area (113 days at 7.00 kg per day), but no LEU was withdrawn as the product and the tails were recombined at the end of the process.
- According to the IAEA's May 2015 report, between February 2, 2015 and May 17, 2015, Iran fed a total of 410.7 kg of natural UF₆ into the centrifuges in the R&D area (105 days at 3.9 kg per day), but recombined the enriched product and depleted tails.
- According to the IAEA's August 2015 report, between May 18, 2015 and August 17, 2015, Iran fed a total of 432.2 kg of natural UF₆ into the centrifuges in the R&D area (92 days at 4.7 kg per day), but recombined the enriched product and depleted tails.

So, for the past six reporting periods, Iran fed a total of about 2,628 kg of natural UF₆ into the advanced centrifuges.

The IAEA reports provide no specific information about the performance of these advanced centrifuges. Because the product and tails are remixed, the IAEA cannot learn about the amount of enriched uranium produced in these advanced centrifuges and is unable to judge the performance of the advanced centrifuges. Under the JPA, however, the IAEA does learn more details about the failure rates of these centrifuges. Iran does not appear to be making drastic changes to its advanced centrifuge R&D efforts, either in numbers installed or in feed rate, ahead of the implementation of the JCPOA and the changes it will need to make to fall in line with advanced centrifuge R&D commitments.

19.75 Percent LEU Production at the Natanz Pilot Plant: Still Halted

From February 2010 to January 2014, Iran designated two, tandem cascades at the smaller, above-ground Pilot Fuel Enrichment Plant for the production of LEU enriched to nearly 20 percent uranium-235, ostensibly for the Tehran Research Reactor. One of these cascades enriched from 3.5 percent LEU to almost 20 percent LEU, while the second one received the tails from the first and outputted roughly 10 percent LEU and a tails of natural uranium. The ten percent material was fed into the first cascade in addition to 3.5 percent LEU. This process allowed Iran to more efficiently use its 3.5 percent LEU stock. **In total, Iran fed 1,631 kg of 3.5% LEU to produce 202 kg of 19.75% uranium since the beginning of operations in February 2010.**

Per its agreement with the P5+1, Iran ceased production of 19.75 percent enriched uranium in these cascades. As of January 21, 2014, the IAEA reported that Iran began enriching to 3.5 percent in the cascades previously designated for 19.75 percent enrichment. Between January 20, 2014 and August 17, 2015, Iran had fed 1,425.2 kg to produce 135.2 kg of LEU enriched up to 5 percent of U-235.

On January 20, 2013, in line with its commitment under the JPA, Iran began downblending some of its inventory of UF₆ enriched to 20 percent U-235 to no more than five percent LEU hexafluoride. Between January 20 and July 20, 2014, Iran down blended a total of 108.4 kg of that material, fulfilling its commitment to down blend half of the 209.1 kg of the nuclear material that had been in the form of UF₆ enriched up to 20% U-235 on 20 January 2014. As of June 19, 2014, it had also fed 100 kg of the remaining near 20 percent LEU hexafluoride into the conversion process at its Fuel Plate Fabrication Plant at Esfahan.

Fordow Fuel Enrichment Plant (FFEP)

The Fordow site has two enrichment halls, Units 1 and 2, which together are designed to contain up to 2,976 centrifuges in 16 cascades. Iran was operating the four cascades of 174 IR-1 centrifuges each in two, tandem sets to produce 19.75 percent LEU in a total of 696 enriching centrifuges, the same number of centrifuges enriching as was reported since 2012. In compliance with the Joint Plan of Action, Iran stopped enriching to 19.75 percent in these cascades and began enriching to no greater than 5 percent LEU hexafluoride.

The Fordow facility remains nearly fully outfitted with centrifuges, though Iran has not increased the number of centrifuges enriching. Figure 11 displays the number of centrifuges enriching and installed at the FFEP graphically.

In total, the Fordow facility produced 245.9 kg of near 20 percent LEU hexafluoride from 1,806 kg 3.5 percent LEU hexafluoride. As of January 21, 2014, the IAEA reported that Iran began enriching to 3.5 percent in the cascades previously designated for 19.75 percent enrichment. Between January 20 and August 8, 2015, Iran had fed 3,680.2 kg of natural uranium hexafluoride to produce a total of 344.6 kg of LEU enriched up to 5 percent U-235.

Production of Near 20 Percent Uranium Oxide at Fuel Plate Fabrication Plant

Iran reported in August 2012 that it began feeding its 19.75 percent uranium hexafluoride into the Fuel Plate Fabrication Plant at Esfahan (FPFP). In total,⁵ Iran had fed a total of 337.2 kg of 19.75 percent enriched uranium hexafluoride into the process at Esfahan to produce U_3O_8 containing about 162.8 kg of enriched uranium oxide (uranium mass). The 337.2 kg of near 20 percent LEU hexafluoride contains about 227.6 kg of enriched uranium (uranium mass). Of the total produced, 0.6 kg of this material was stored in hexafluoride form as reference material for mass spectrometry and placed under IAEA seal. The IAEA verified 55.4 kilograms of this near 20 percent LEU in liquid or solid scrap form. Thus, approximately 9.4 kg of near 20 percent LEU (uranium mass) remain held up in the process or in waste.

As of August 19, 2015, Iran has used a total of 121.8 kg for the manufacturing of fuel items for the Tehran Research Reactor (TRR). This process generated 31 kg of solid scrap. The IAEA also reports that as of August 19, Iran had produced one experimental fuel assembly and 37 TRR-type fuel assemblies, which constitutes an increase of three fuel assemblies since May. The TRR fuel and assemblies and plates contain about 48.7 kilograms of near 20 percent LEU (U-mass). Thus, of the total amount of 227.6 kg of near 20 percent LEU (uranium mass) sent for conversion, about 21 percent has so far been made into fuel assemblies for the TRR.

As of August 18, 2015, 21 of the 30 assemblies transferred to TRR were in the core. The core contains a total of 33 fuel assemblies. Since the last reporting period, two additional standard fuel assemblies have been irradiated. These additional assemblies contained a total of 2.4 kilograms of uranium.

In sum, despite the fact that Iran no longer has a stock of near 20 percent low enriched uranium in hexafluoride form, it continues to retain a significant portion of this material in the form of oxide. In total, as of May 2015, Iran had about 228 kg of near 20 percent LEU (uranium mass).

As of August 2015, Iran had an estimated 41 kg in uranium oxide powder, 48.7 kg in TRR fuel assemblies, and 137.9 kg in scrap, waste, and in-process (see figure 12).

Iran Seeking to Produce Miniature Fuel Plates for Production of Molybdenum-99

⁵ The entire inventory of this material had been processed by July 20, 2014.

On December 28, 2014, Iran notified the IAEA that it would start manufacturing miniature fuel plates for the Molybdenum, Iodine and Xenon Radioisotope Production (MIX) Facility, for the production of Molybdenum-99. As of August 19, 2015 the IAEA confirmed that one fuel plate containing a mixture of U_3O_8 enriched up to 20 percent U-235 and aluminum was at the MIX Facility and was being used for R&D activities for the production of ^{99}Mo , ^{133}Xe , and ^{132}I isotopes. Iran has used 0.084 kg of near 20 percent uranium oxide for the purpose of producing ^{99}Mo .

According to an August 18 and 19, 2015 DIV at the MIX Facility and DIV and PIV at the TRR, the IAEA confirms no ongoing reprocessing activities are taking place at those facilities.

Enriched UO_2 Powder Plant (EUPP)

The commissioning of the EUPP facility began in May 2014 using natural uranium. The IAEA's most recent report states that as of August 17, 2015, Iran has fed a total of 6319 kg of natural UF_6 into the conversion process and produced 1828.8 kg of natural uranium in the form of UO_2 .

From July 2014 through November 2014, Iran fed 2,720 kg of UF_6 enriched up to 5 percent U-235 into the conversion process for the production of UO_2 . Between November 2014 and May 2015 Iran had not fed any additional UF_6 enriched up to 5 percent U-235 into the conversion process. Between May 2015 and August 17, 2015, Iran fed an additional 1,584 kg of UF_6 enriched up to 5 percent U-235 into the conversion process. Therefore, Iran has fed a total of 4,304 kg of UF_6 enriched up to 5 percent U-235 into the conversion process at the EUPP.

After a lengthy delay, the EUPP finally started producing LEU dioxide, albeit at a much reduced rate. As of August 17, 2015, the plant had produced 465.8 kg of uranium in the form of UO_2 enriched up to 5 percent uranium 235.

Taking Stock

According to the most recent IAEA report, Iran has produced a total of 15,651.4 kilograms of 3.5 percent LEU hexafluoride, which constitutes an increase of 714.7 kilograms since the previous IAEA report. Almost all of this LEU was produced at the Natanz and Fordow enrichment facilities; 115.6 kg of this material comes from down blending near 20 percent LEU hexafluoride. About 3,437 kilograms had been used to make the 19.75 percent LEU hexafluoride, leading to a total of 12,214.4 kg of 3.5 percent LEU hexafluoride. Another 4,304 kg of this LEU hexafluoride was fed into the EUPP to make oxide, and 53 kg of this LEU was fed in the uranium conversion facility to produce uranium dioxide, for a remaining total of 7,857.4 kg of LEU hexafluoride. The IAEA reports that the total 3.5 percent LEU hexafluoride inventory is 7,845.4 kg, a difference of 12 kg from the value derived above. We could not explain the reason for the difference.

Based on the IAEA values in the report, the total inventory is 7,845.4 kg of 3.5 percent LEU hexafluoride and the equivalent of another 4,304 kg of 3.5 percent LEU hexafluoride in various

chemical forms at the EUPP. In total, Iran has the equivalent of 12,149 kg of 3.5 percent LEU hexafluoride.

Across its three centrifuge facilities, Iran has installed 18,458 IR-1 centrifuges and 1,008 IR-2m centrifuges. Figure 7 shows IR-2m trends in Iran, and Figure 8 shows historical cumulative IR-1 centrifuge trends in Iran.

Combined, the PFEP at Natanz and the FFEP have produced 448 kg of 19.75 percent uranium, though Iran ceased production of this material on January 20, 2014. Figure 9 represents the cumulative production of 19.75 percent enriched uranium in Iran.

Under the terms of the Joint Plan of Action, Iran has downblended a total 110 kg of 19.75 percent LEU hexafluoride into LEU enriched to less than five percent, including 1.6 kg diluted previously. Since Iran began conversion at its declared facilities, it has fed into the process line at the Fuel Plate Fabrication Plant at Esfahan 337.2 kilograms of uranium hexafluoride enriched up to 20 percent uranium-235, or 227.6 kilograms of enriched uranium, and it produced 162.8 kilograms of near 20 percent enriched uranium in the form of U_3O_8 powder (U-mass). At present, Iran does not possess a stock of near 20 percent LEU hexafluoride. However, as of August 19, 2015, Iran had 41 kg in uranium oxide powder, 48.7 kg in TRR fuel assemblies, and 137.9 kg in scrap, waste, and in-process (all in uranium mass).

Table 2 summarizes these findings.

Iran has achieved varying rates of separative work in the IR-1 centrifuge at its enrichment plants. Although Iran continues to install and enrich in additional centrifuges at the FEP, the enrichment output measured in swu/centrifuge-year at this plant has varied and declined overall. During this reporting period, the FFEP achieved 0.78 swu/centrifuge-year, slightly lower than the last reporting period but a 0.07 swu/centrifuge-year decrease from the January-October 2015 reporting period. The PFEP cascades achieved 0.64 swu/centrifuge-year, 0.01 lower than the previous reporting periods. Table 3 compares the enrichment output at the FEP, PFEP, and FFEP. Figure 10 shows the average swu per year per centrifuge at the PFEP and FFEP.

Arak IR-40 Reactor and Heavy Water Production Plant

The IAEA confirmed through a Design Information Verification (DIV) on August 17, 2015 at the IR-40 reactor at Arak that no additional major components of the reactor have been installed. Additionally, the IAEA confirmed that Iran has not manufactured any fuel assemblies at the Fuel Manufacturing Plant (FMP) for the reactor.

On August 18, 2015, the IAEA carried out an inspection and a DIV at the FMP at Esfahan and, as previously reported, “verified that Iran had continued its cessation of production of nuclear fuel assemblies using natural UO_2 for the IR-40 Reactor and that all of the fuel assemblies that had been produced previously remained at FMP.”

As mentioned in previous reports, the IAEA has not had access to the Heavy Water Production Plant (HWPP) since December 2013 or to stored heavy water at the Uranium Conversion Facility at Esfahan since February 2014, which it was then able to characterize.

IAEA and Iran Complete First Phase of Roadmap on Resolution of PMD

On July 14, 2015, the IAEA and Iran signed a joint “Roadmap for the clarification of past and present outstanding issues regarding Iran’s nuclear programme,” otherwise known as the possible military dimensions (PMD) of Iran’s nuclear activities as reported in the IAEA’s November 2011 safeguards report. The Roadmap is referred to in the JCPOA as an agreement that Iran must carry out before Implementation Day, or the day when major sanctions are lifted. On August 15, 2015, as stipulated in the Roadmap, Iran “provided the Agency its explanations in writing and related documents, on past and present outstanding issues” and the IAEA is “reviewing this information.”

According to the Roadmap, the IAEA will finish its review and by September 15 “submit to Iran questions on any possible ambiguities regarding such information.” After the IAEA has submitted these questions, meetings between the IAEA and Iran will take place to remove ambiguities, a separate arrangement will be carried out regarding the resolution of issues regarding the alleged Parchin high explosives test site, and by October 15, the activities will be completed. By December 15, the IAEA Director General will provide a final assessment, for action by the Board of Governors, on the resolution of all past and presenting outstanding issues in Iran. Iran has stated that it will then present in writing its own comprehensive assessment to the IAEA regarding the report.

Renewed Activities Observed at Parchin

The IAEA reports that it has continued to observe “through satellite imagery, the presence of vehicles, equipment and probable construction materials” at a particular location at the Parchin military site. The IAEA also observed that “a small extension to an existing building appears to have been constructed.” A site within the complex was allegedly the location of high explosive tests carried out by Iran related to nuclear weaponization. The IAEA first requested access to the site for inspection purposes in February 2012 and was denied. Thereafter the IAEA, and ISIS in a [series of open source satellite imagery analyses](#), observed activities at the site undertaken by Iran that were likely aimed at sanitization or concealment of previous activities, including for example, paving, removal or modification to buildings, scraping earth, and washing. The IAEA states that such activities are “likely to have undermined [its] ability to conduct effective verification.”

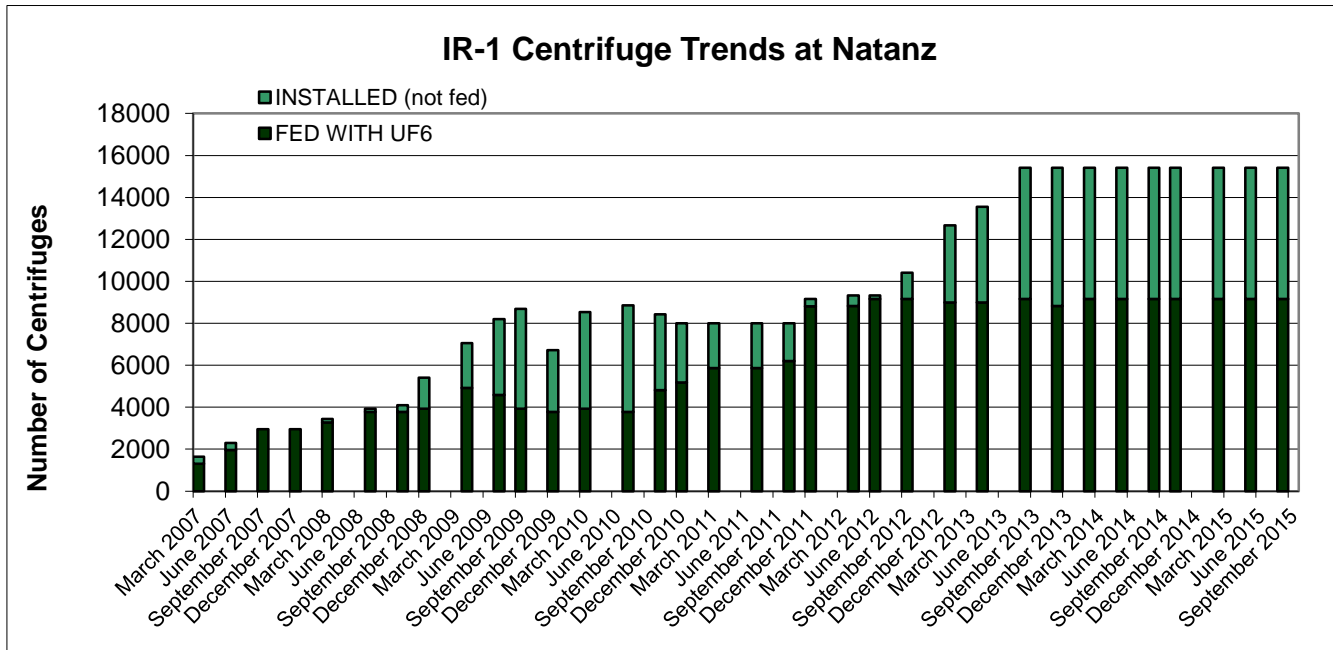
These IAEA findings support ISIS’s [August 5 analysis](#) that Iran had renewed activities at Parchin just after the July 14 signing of the JCPOA, or at least by July 26 (see figure 13). Imagery from July 12 and 19 did not show new activities, including the presence of heavy vehicles and modifications to a rooftop. ISIS had decided to analyze recent high resolution commercial satellite imagery of the site following [reports](#) of a U.S. intelligence community briefing to members of Congress reporting on renewed activity at the Parchin site after the signing of the

JCPOA. Some nonproliferation experts, in particular [Robert Kelley](#), subsequently tried to maintain that no renewed activity had occurred at the site. This IAEA finding supports ISIS's finding that Kelley's assessment is incorrect.

Parchin Separate Arrangement II

Between September 15 and October 15, Iran is expected to carry out a separate arrangement under the IAEA/Iran Roadmap aimed at resolving outstanding issues regarding past activities at the Parchin site. This arrangement is secret, and the IAEA has refused to provide it to the IAEA member states or the public, although it has briefed member states about its contents. Nonetheless, the Associated Press [viewed and transcribed](#) a draft of this special arrangement for Parchin, which was not subsequently disputed as to its details by U.S. or IAEA officials. The AP further reported that the final deal does not differ significantly from the draft.

Figure 1: IR-1 Centrifuge Trends at Natanz FEP**



** The dark green bar represents the number of IR-1 centrifuges enriching, while the light green represents the number of IR-1 centrifuges installed but not enriching. The sum of the two represent the total number of IR-1 centrifuges installed at the FEP.

Figure 2: Uranium Hexafluoride Feed at the Natanz FEP

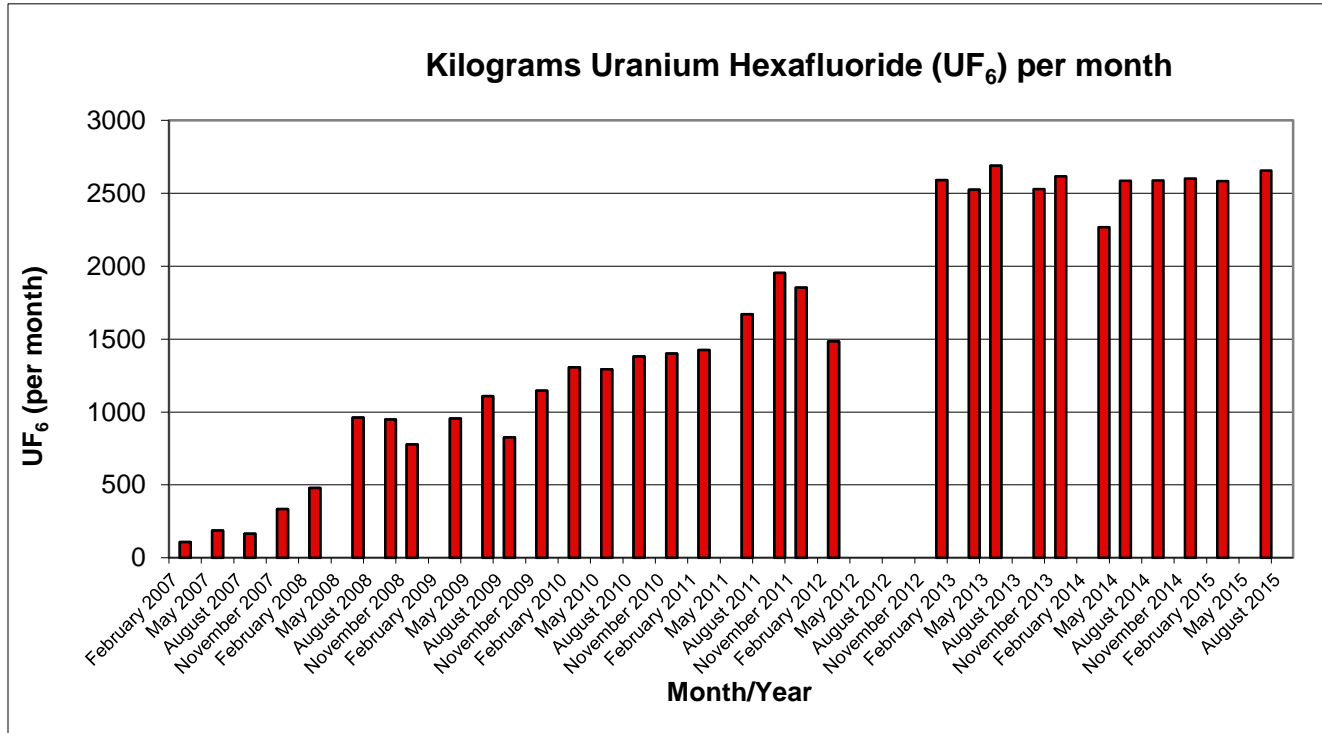


Figure 3: LEU Production (kilograms uranium hexafluoride per month) at Natanz FEP

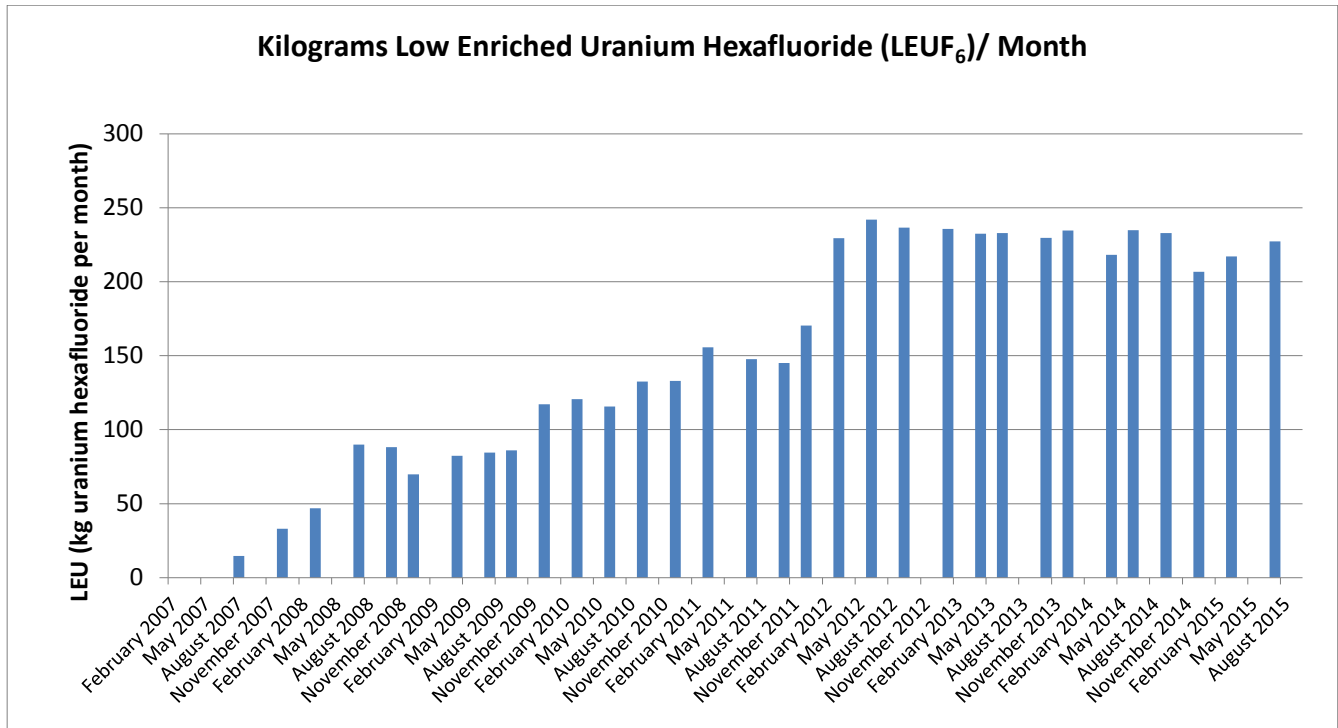


Figure 4: Overall Trends at Natanz FEP

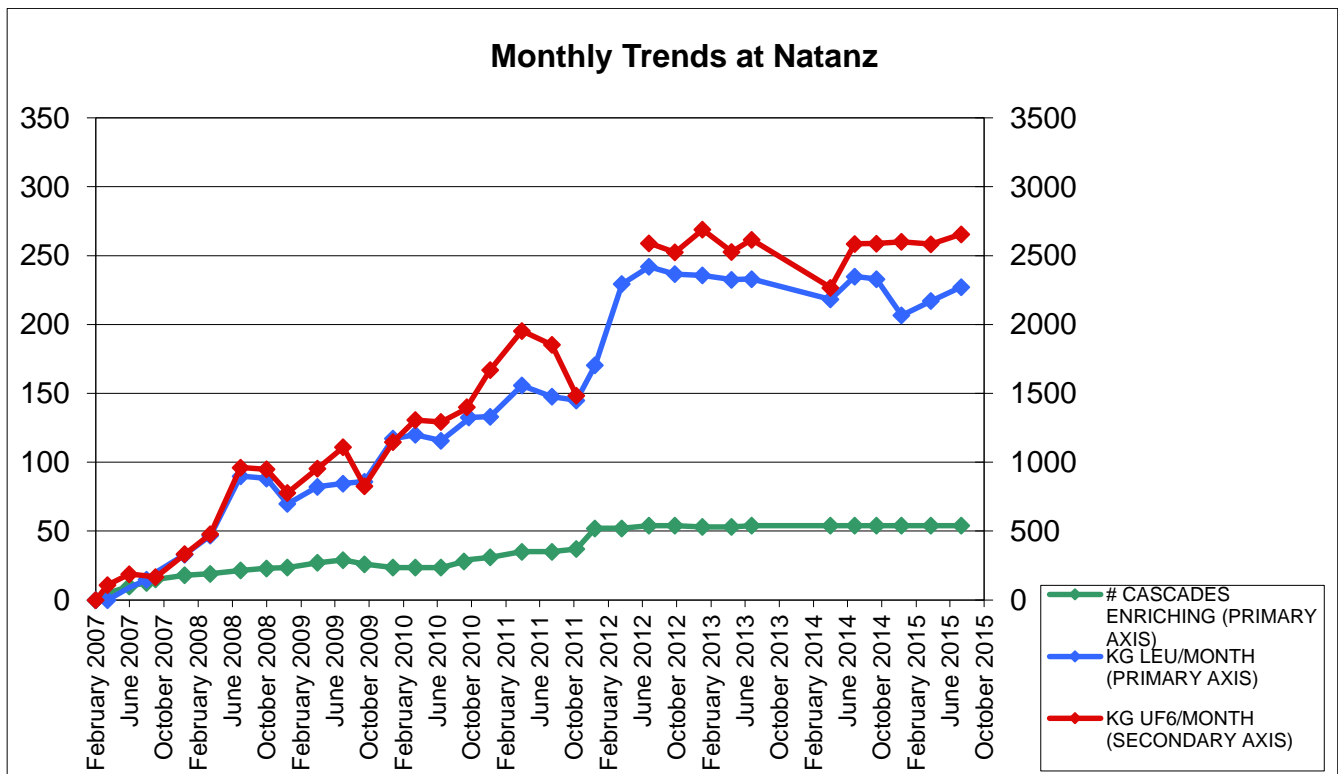


Figure 5: Cumulative LEU Production at the Natanz FEP

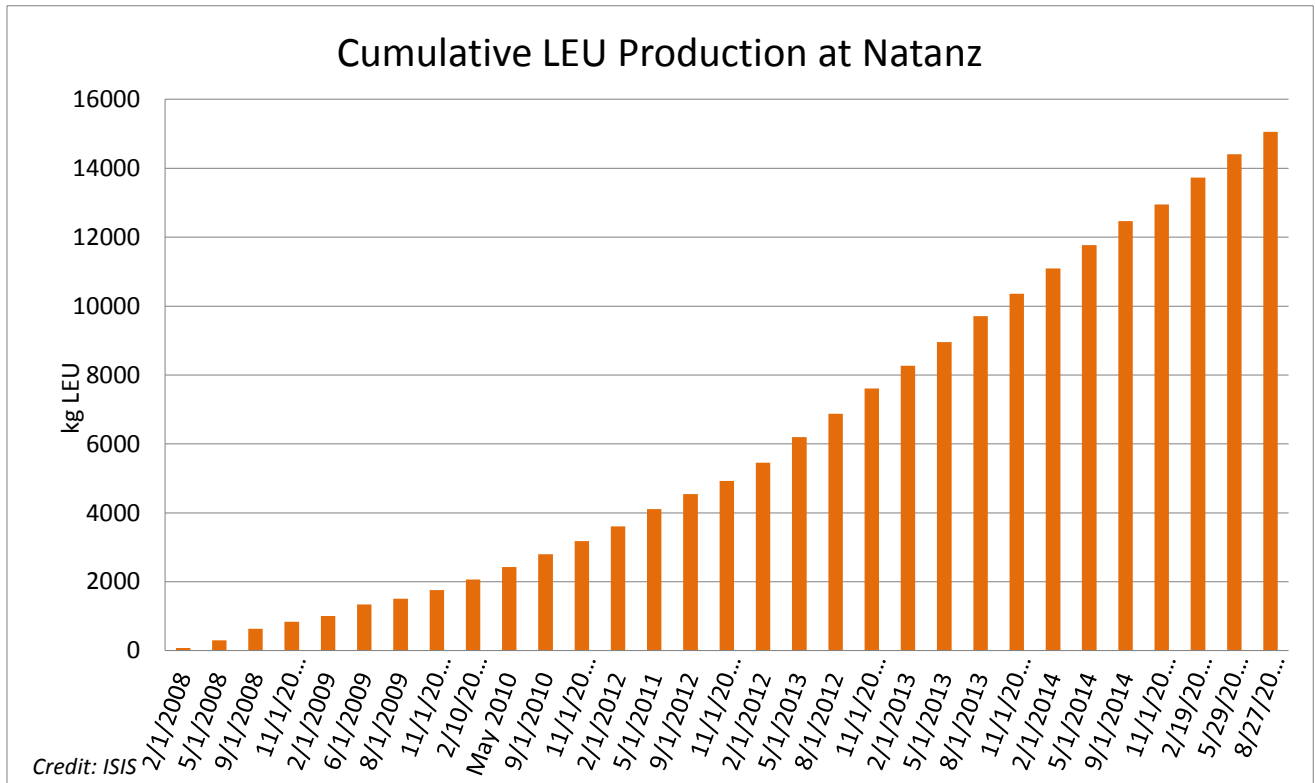


Figure 6: Annualized SWU at Natanz FEP

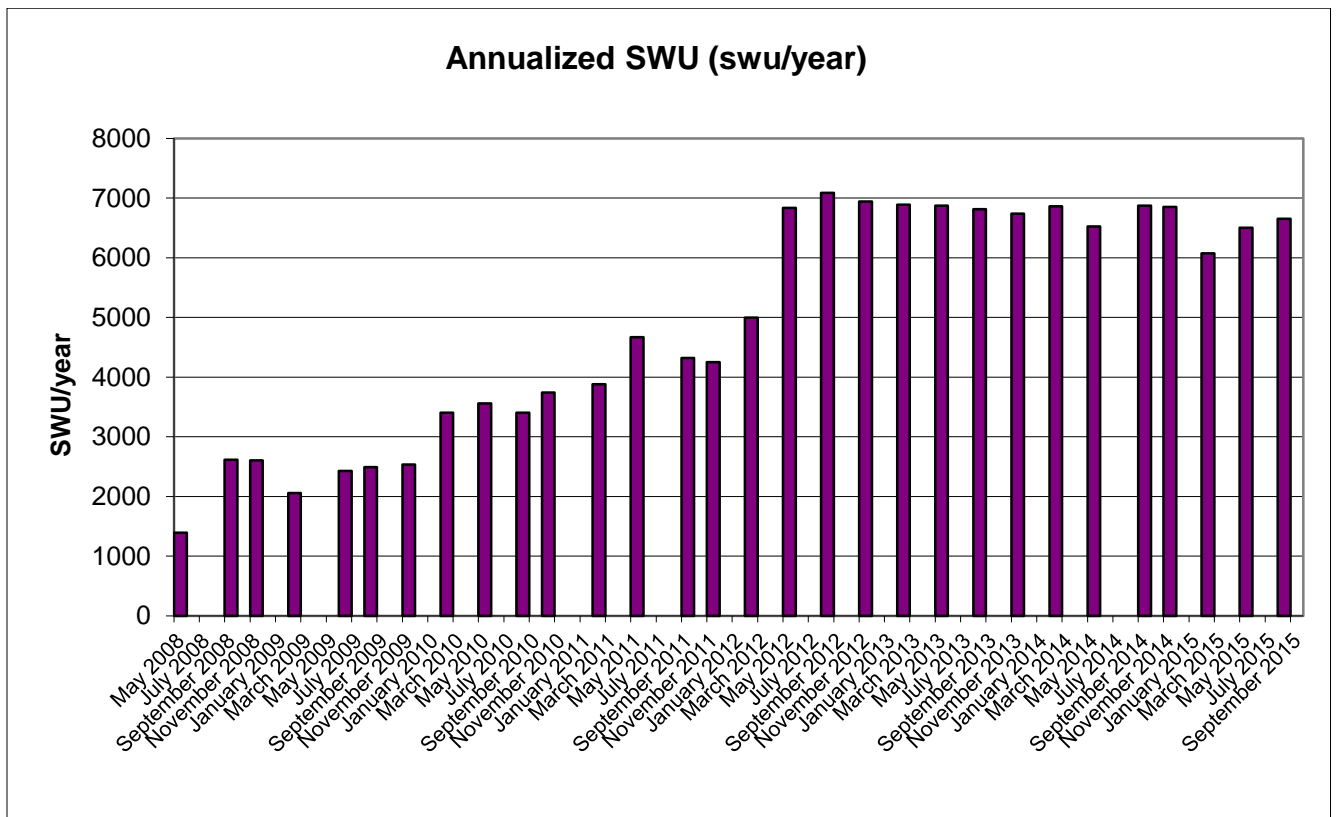


Figure 7: IR-2m Progress at the FEP

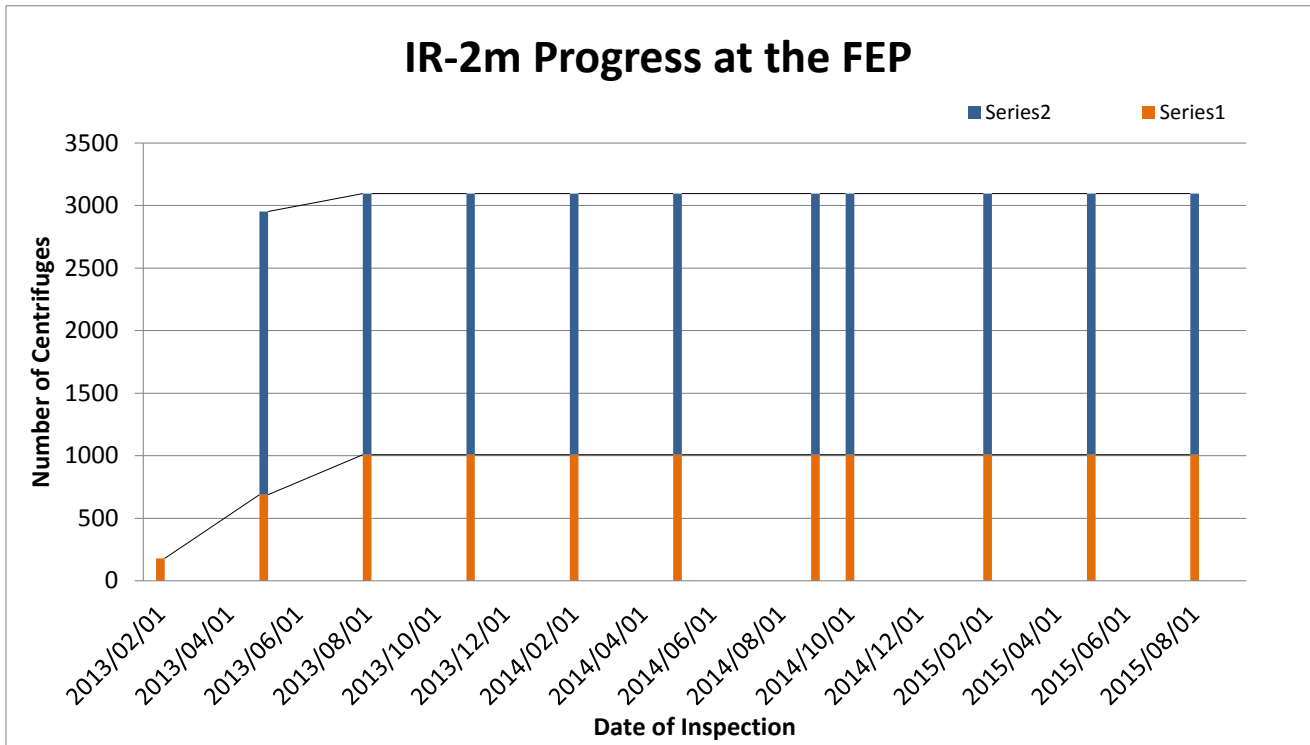


Figure 8: Total Number of Deployed IR-1 Centrifuges in Iran

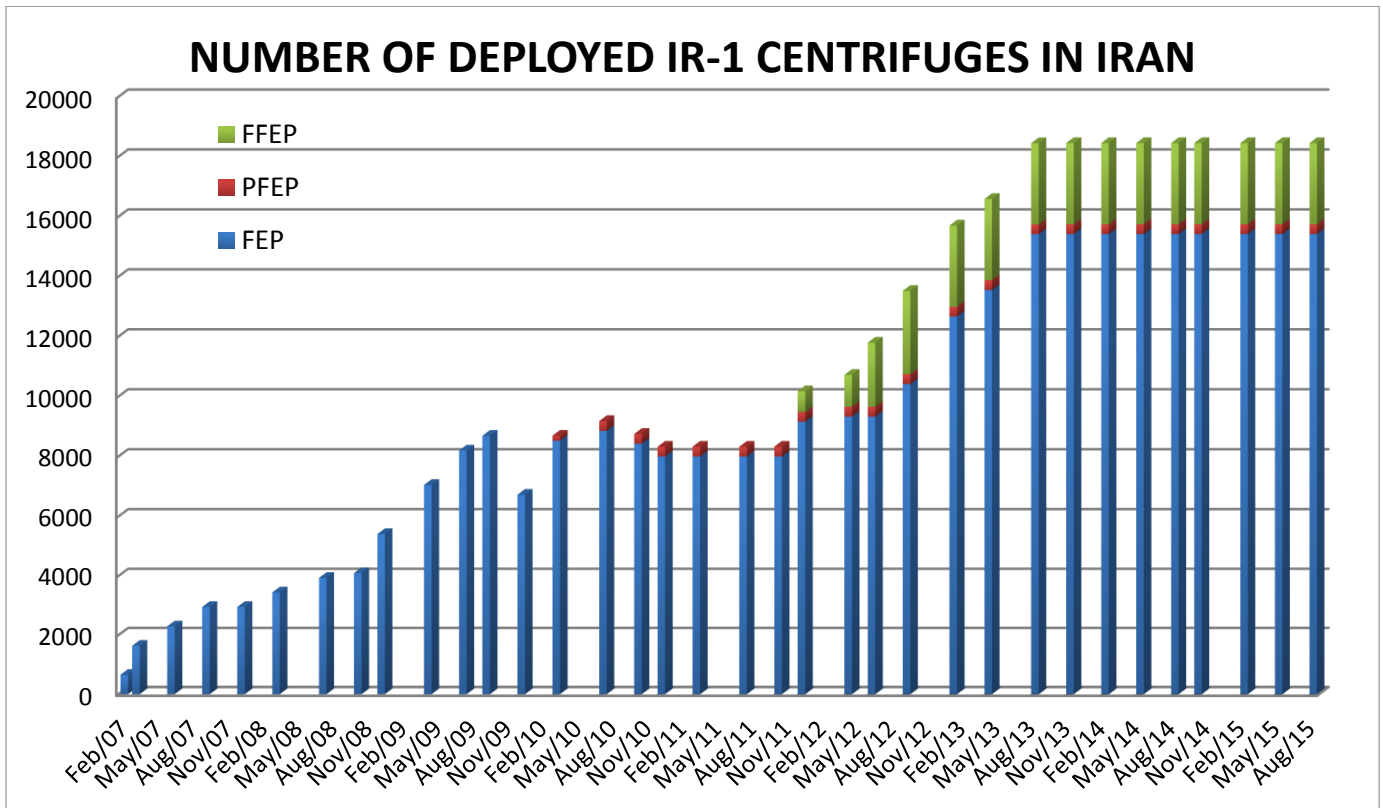


Figure 9: Cumulative 19.75 Percent Uranium Production in the PFEP and FFEP

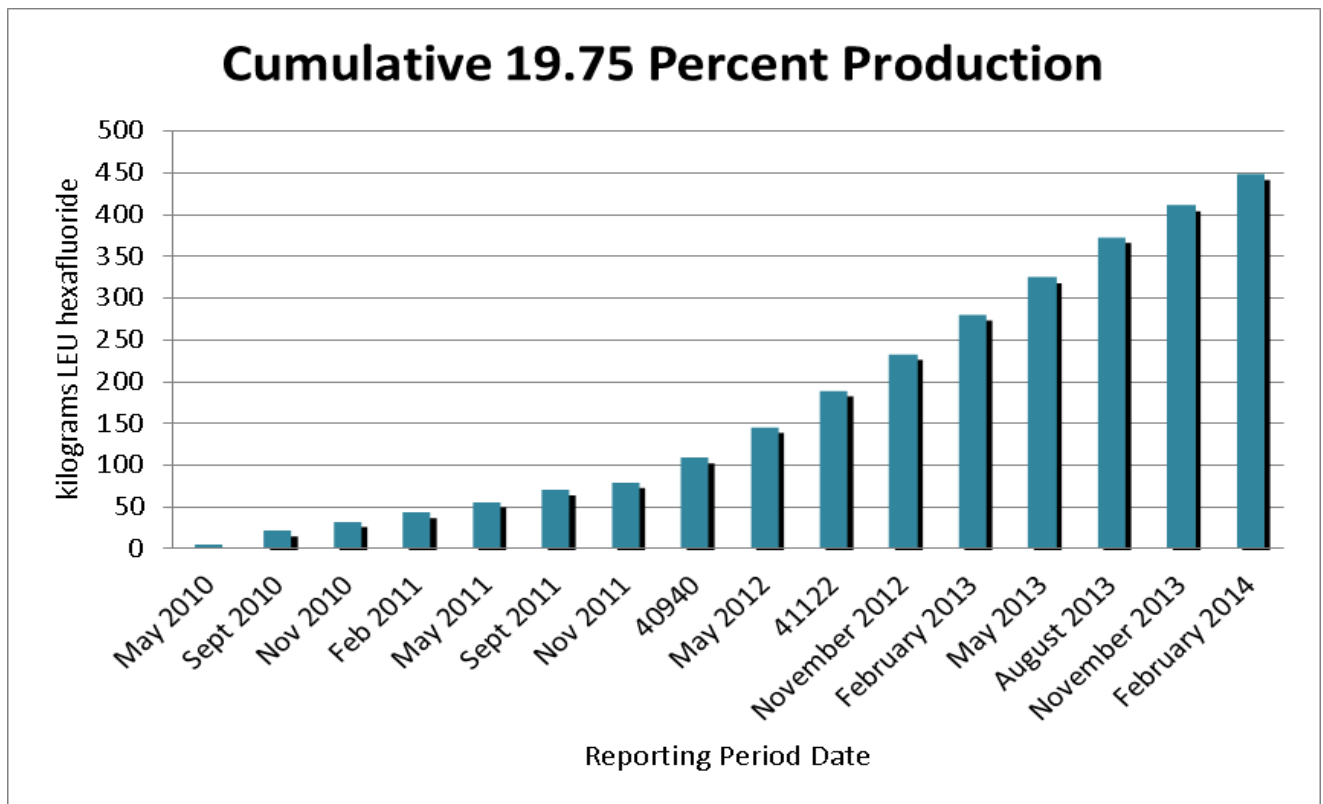


Figure 10: SWU/Centrifuge-year at the Fordow Fuel Enrichment Plant and Pilot Fuel Enrichment Plant

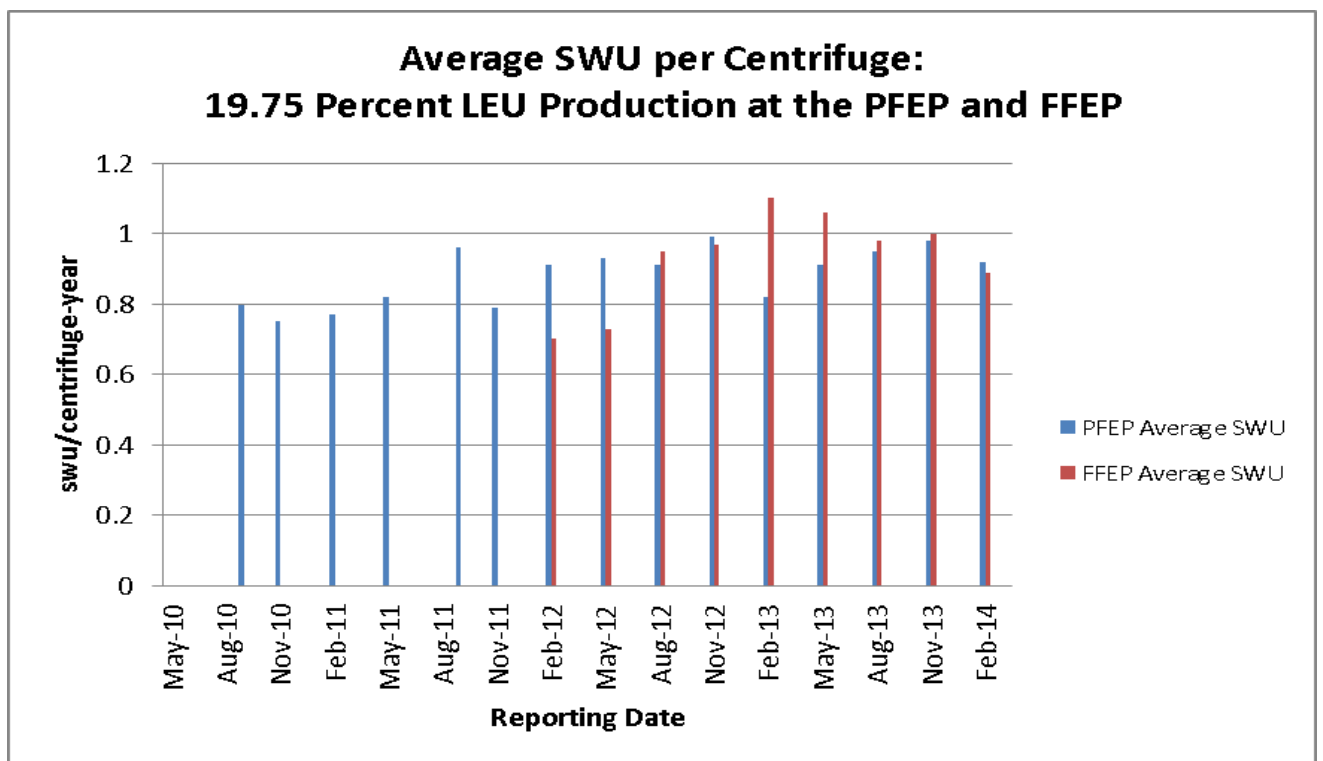
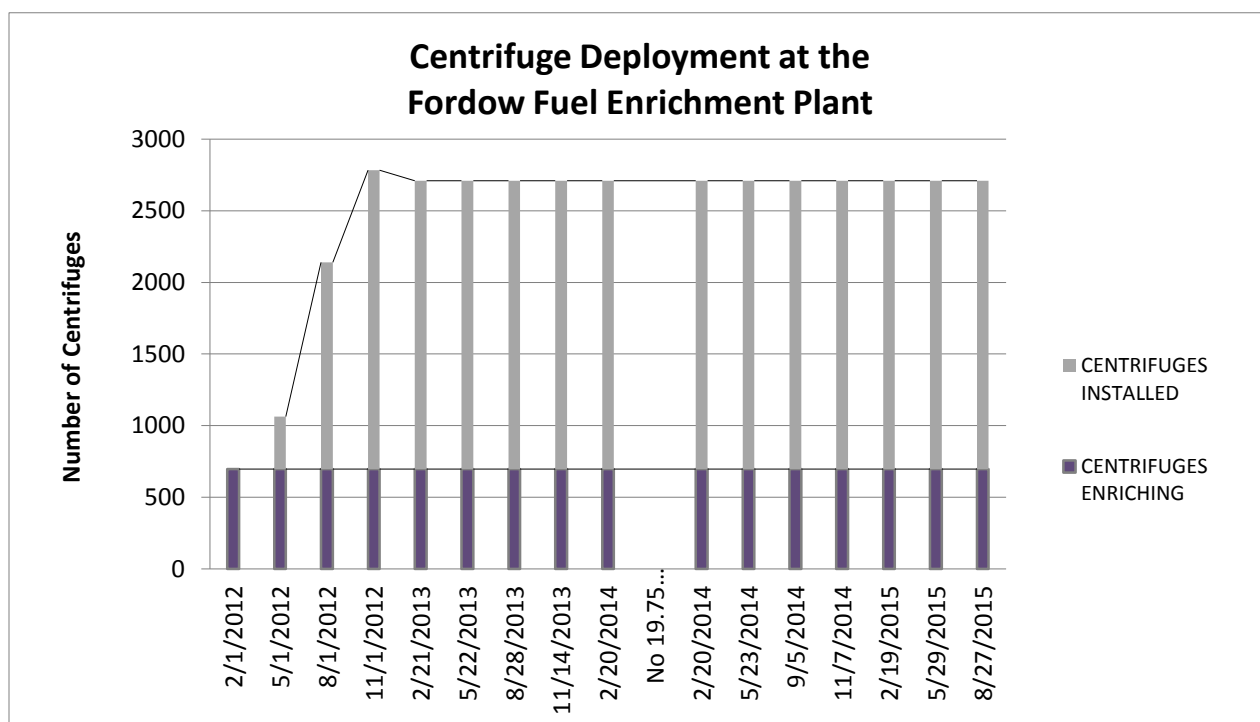
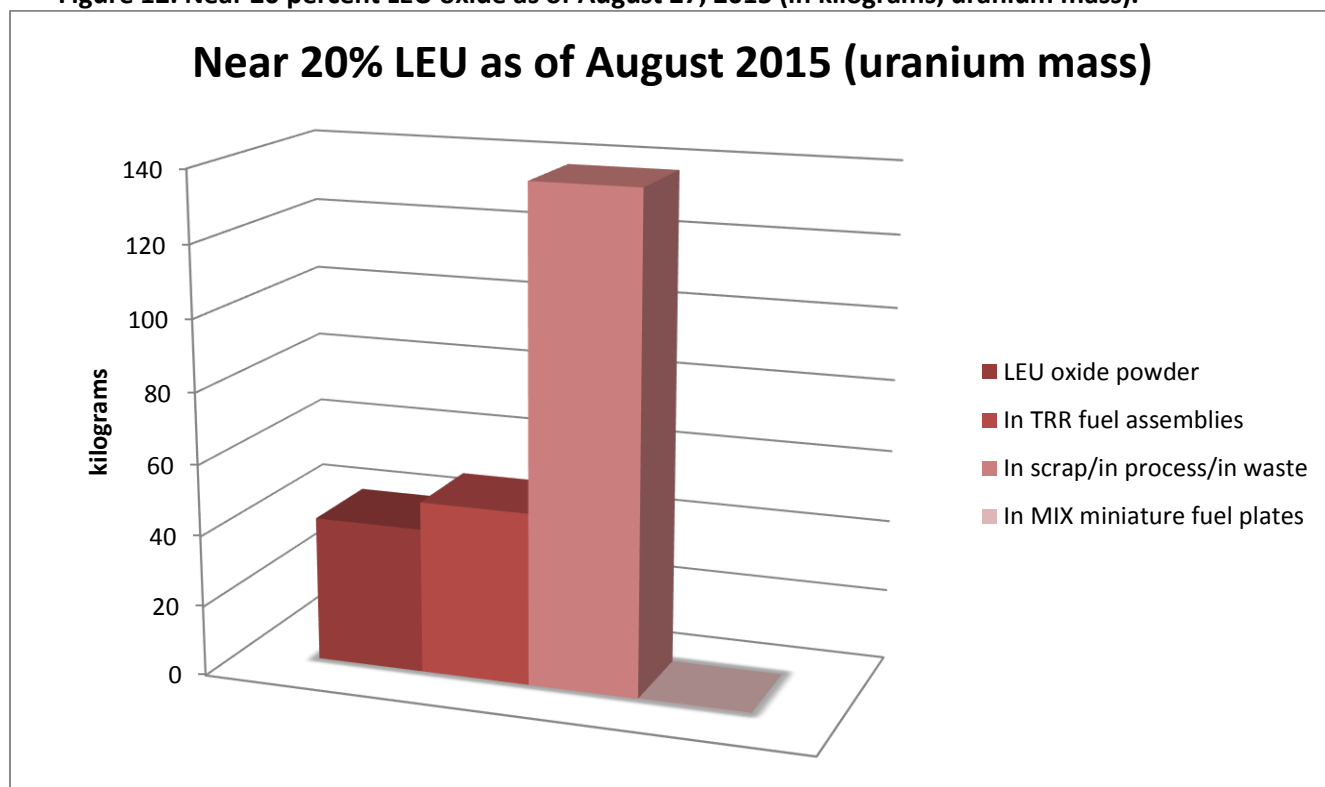


Figure 11: IR-1 Centrifuges Enriching and Installed at the Fordow Fuel Enrichment Plant



Note: All centrifuges are now dedicated to the production of 3.5 percent LEU.

Figure 12. Near 20 percent LEU oxide as of August 27, 2015 (in kilograms, uranium mass).



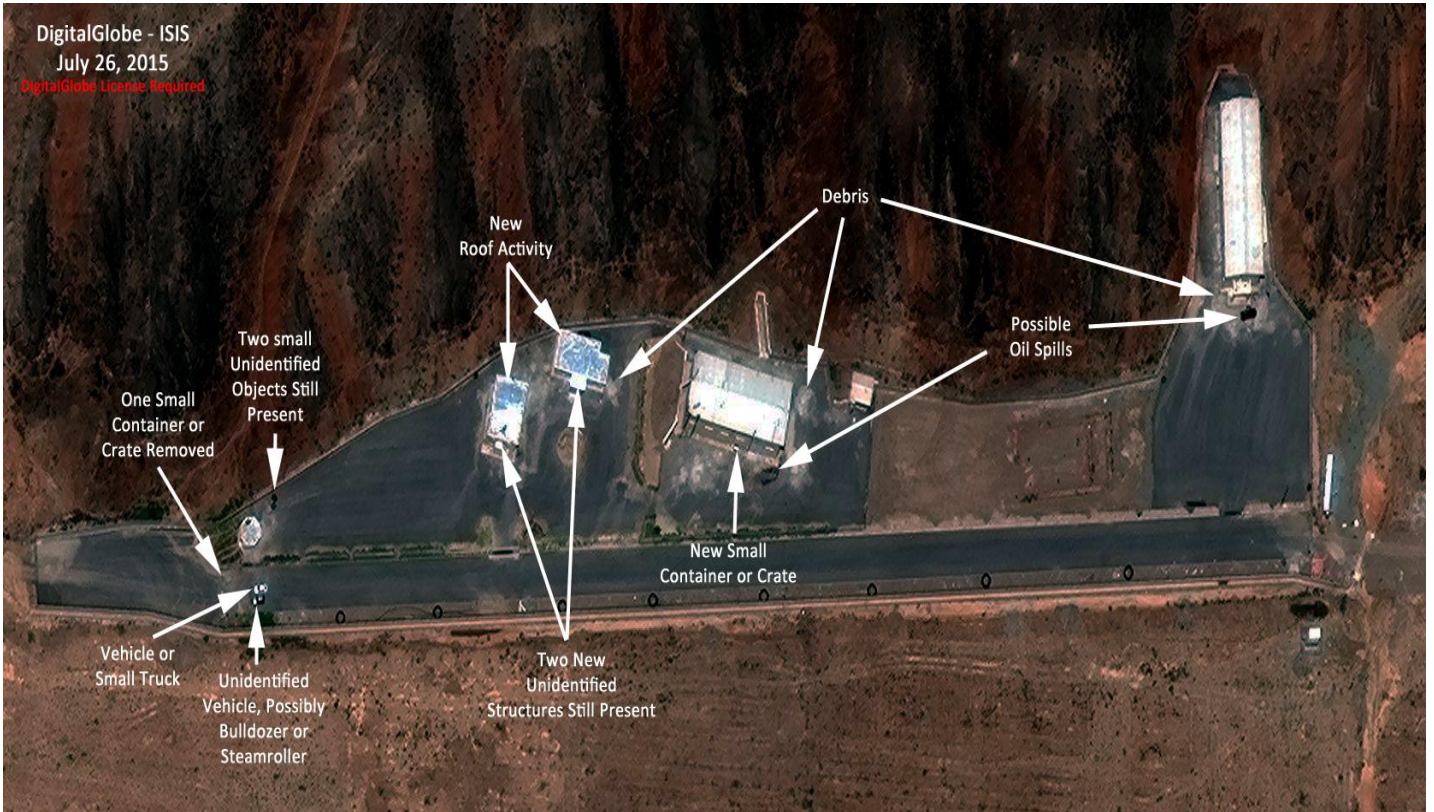


Figure 13. DigitalGlobe imagery showing the status of the alleged high explosive test site at the Parchin military complex on July 26, 2015.

**Table 1: Minimal Average Separative Capacity of an IR-1 Centrifuge at the FEP
(kg U swu/year-centrifuge)**

<i>Period</i>	<i>Start of Period</i>	<i>End of Period</i>
12/13/2007 – 05/06/2008	0.47	0.43
05/07/2008 – 08/30/2008	0.80	0.69
08/31/2008 – 11/07/2008	0.69	0.69
11/08/2008 – 11/31/2009	0.55	0.52
02/01/2009 – 05/31/2009	0.62	0.49
06/01/2009 – 07/31/2009	0.51	0.54
08/01/2009 – 10/30/2009	0.55	0.64
11/23/2009 – 01/29/2010	0.88	0.92
01/30/2010 – 05/01/2010	0.92	0.90
05/02/2010 – 08/06/2010	0.90	0.92
08/07/2010 – 10/31/2010	0.99	0.78
10/18/2010 – 02/05/2011	0.75	0.81 ⁶
02/06/2011 – 05/13/2011	0.90	0.80
05/14/2011 – 08/13/2011	0.74	0.74
08/14/2011 – 11/01/2011	0.73	0.68
11/02/2011 – 02/04/2012	0.76 ⁷	0.53
02/05/2012 – 05/11/2012	0.77	0.77
05/12/2012 – 08/06/2012	0.77	0.77
08/07/2012 – 11/09/2012	0.77	0.76
11/10/2012 – 02/03/2013	0.75	0.76
02/04/2013 – 05/04/2013	0.76	0.76
05/05/2013 – 08/16/2013	0.76	0.74
08/17/2013 – 11/05/2013	0.74	0.76
11/06/2013 – 02/09/2014	0.78	0.75
02/10/2014 – 05/13/2014	0.71	0.71
05/14/2014 – 08/13/2014	0.75	0.75
08/14/2014 – 10/15/2014	0.75	0.75
10/15/2014 – 02/07/2015	0.66	0.66
02/08/2015 – 05/12/2015	0.71	0.71
5/13/2015-8/7/2015	0.73	0.73

⁶ 1.0 if 1,000 questionable centrifuges ignored.

⁷ Note: Iran began enriching in approximately 2,600 additional centrifuges during this period. Therefore, these data are likely skewed.

**Table 2: CUMULATIVE TOTALS OF NATURAL AND ENRICHED URANIUM FEED
AND 3.5 AND 19.75 PERCENT LEU HEXAFLUORIDE PRODUCT IN IRAN**

LOCATION	0.711 percent hex feed	3.5 percent LEU hex product	3.5 percent LEU hex feed	19.75 percent LEU hex product
FEP	172,375 kg	15,056 kg	N/A	N/A
PFEP	1,425.2 kg	135.2 kg	1,631 kg*	202 kg*
FFEP	3,680.2 kg	344.6 kg	1,806 kg*	246 kg*
GROSS TOTAL	177,480.4 kg	15,651.4 kg**	3,437 kg	448 kg
NET TOTAL	177,480.4 kg	7,857.6 kg***	3,437 kg	0.6 kg****

* Figures as of January 20, 2014, when the production of 20 percent enriched LEU has ceased.

** This total also includes the LEU (<5% uranium 235) resulting from downblending the near 20 percent LEU hexafluoride covered by the Joint Plan of Action, or 115.6 kg.

*** This number, based on step-by-step calculations, differs slightly from the amount given by the IAEA in its latest report, which is 7,845.4 kilograms, for a difference of 12.2 kilograms. This difference was also present in every report dating back to February 2014. The difference in the November 2013 report was 0.4 kilograms. The reason for the differences are unclear.

**** Reference material, under IAEA seal. It should also be noted that Iran maintains a relatively large stock of new 20 percent LEU oxide.

**Table 3: COMPARATIVE SWU Rate* IN IR-1 CENTRIFUGES AT IRAN'S
ENRICHMENT FACILITIES**

LOCATION	IR-1 centrifuges producing 3.5 percent enriched uranium	IR-1 centrifuges producing 19.75 percent enriched uranium
FEP	0.73 swu/cent-year	N/A
PFEP	0.64 swu/cent-year	N/A
FFEP	0.78 swu/cent-year	N/A

*SWU rate represents an average of the SWU/centrifuge-year calculated using the number of centrifuges at both the beginning and the end of the reporting period.